APPENDIX A: FUTURE SCENARIOS

1.1. Scenario 3: Protectionist Commodity Rush into Africa

1.1.1. Scenario Narrative

The year is 2038 and Africa has unlocked unsurpassed mineral wealth. The Democratic Republic of Congo (DRC) and Zambia have an oligopolistic supply of the electric car market (which now makes up 87% of all cars) with the world's last significant copper and lithium deposits. Ghana has discovered deep gold deposits with new mining technology. Namibia and Niger supply uranium to most of the world's new nuclear-renewable hybrid power generation stations. Major exploration projects have been ongoing since 2032, with incredibly positive results and so it is expected that Africa will sustain the global demand for resources over the next few centuries as other countries start depleting their mineral supplies.

However, African governments have taken notice of the lucrative revenues that mining companies earn from their resources, whilst these moneys exit the country towards international owners, leaving local communities and the economy stagnant. Social upliftment and economic recovery have therefore remained constant and potential benefits from job creation in other sectors (i.e. manufacturing) have been missed. Mines have been nationalised across Africa in adherence to the new African Development and Mineral Wealth Agreement since 2036 and corporates have subsequently left operations in the hands of government control. The impact has been devastating, with large-scale labour layoffs becoming the norm in every transfer deal. Also, the transitioning of ownership has impacted on these operations' production, which has left a shortage in the market, causing commodity prices to rise significantly.

This is regarded as the Protectionist Commodity Rush into Africa scenario.

1.1.2. Scenario Analysis

Figure 1 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the Protectionist Commodity Rush into Africa scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	**1**	**1**	1	1	**1**
	0	0	0	**0**	**0**	0
	-1		-1	-1	-1	

Figure 1: Scenario 3 - State Vectors

Figure 2 and Figure 3 shows the results of this scenario. It is evident that Export Revenue, Foreign Direct Investment and GDP Growth decrease significantly, while Regulatory Environment Uncertainty, Government Demands and Labour Unrest increases. These results show quite a negative result for this scenario however Pressure on Margins is seen to reduce slightly, indicating that mines may be profitable in this scenario. It should be noted that when government owns the mine, then pressure on margin decreases as the state is subsidising the operations.

These results show a negative position for the future of SA Mining.

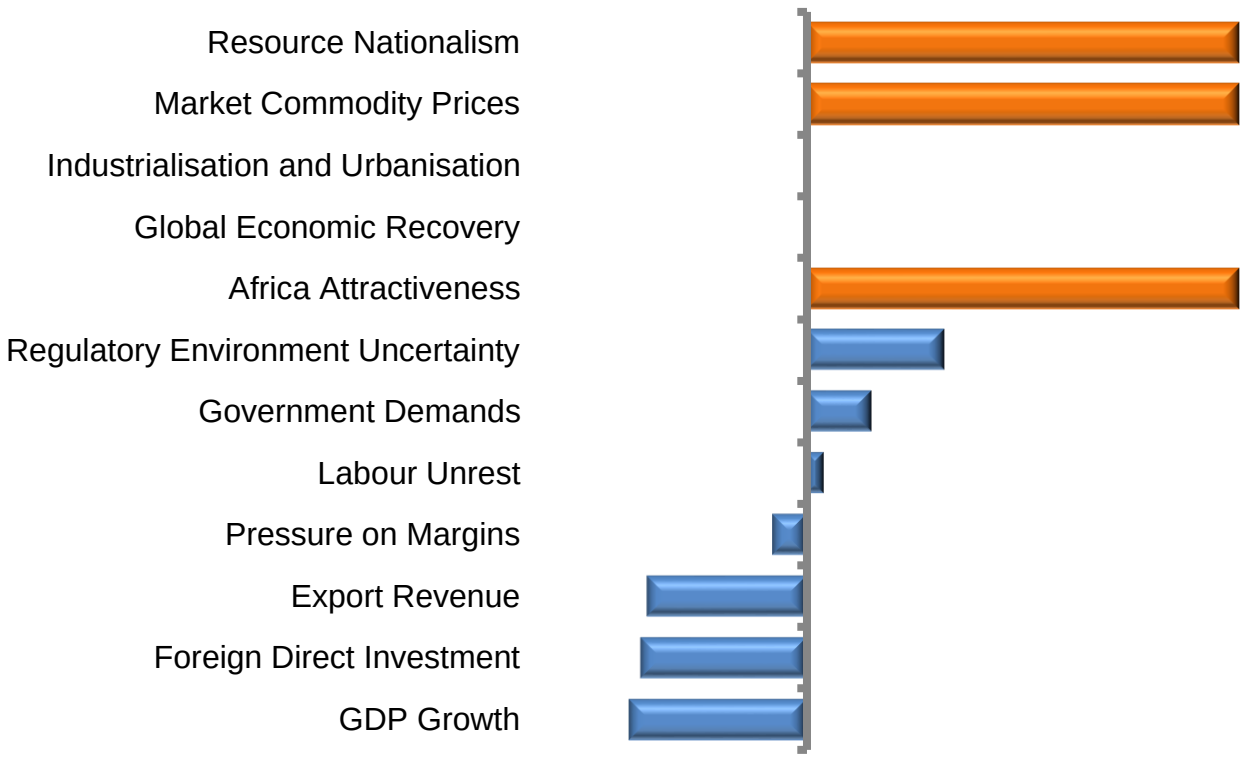

Figure 2: Scenario 3 - Results (Median)

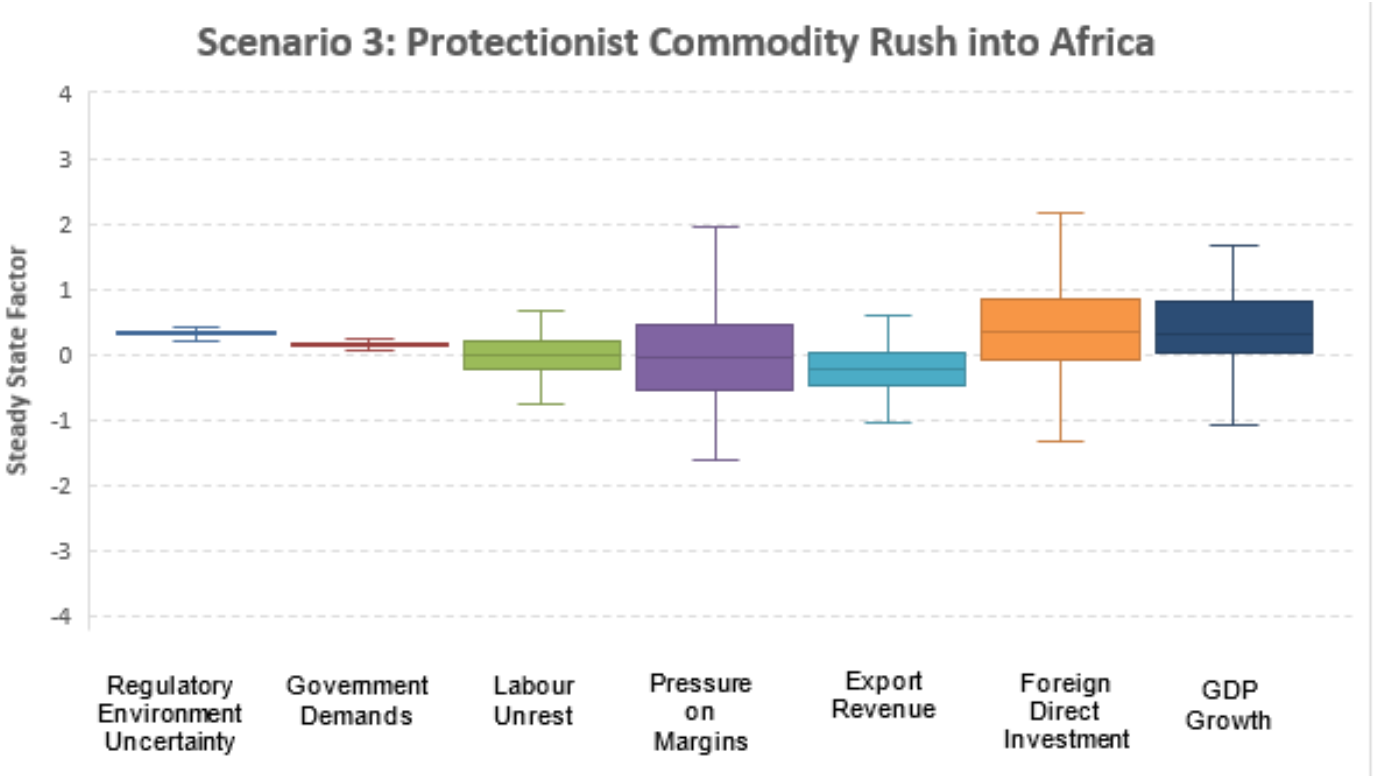

Figure 3: Scenario 3 - Results (Boxplot)

1.2. Scenario 4: World War III

1.2.1. Scenario Narrative

The year is 2038 and the war is at its peak after four years. After China's initial invasion of California with bombers and ground troops over global trade dominance, the US had responded with nuclear warheads, knowing a retaliation was guaranteed. Several allies on both sides had joined the fight, including Russia, Canada, Germany, France, North Korea and Japan and technologies such as lethal airborne viruses and intelligent drones have surfaced which have left a trail of destruction around the world. The war has now evolved to cyber space, where global commerce and governments have become isolated due to a hacking war in the digital arena. A key driver of the war is access to water and other basic resources as the population has increased to severely unsustainable levels ~ 11.3bn people.

In order to fund the war, certain resources have become extremely valuable with allies willing to pay major premiums for commodities and as a result several new mines have been started in Africa to keep up with demand. Nationalism of mines has taken over in African states during this time of war to protect assets and ensure resources are employed in accordance with the interests of the state.

People have been separated from their home towns due to mass destruction in certain areas and war strategies. Mostly, people have been relocated to rural areas and many countries who once sourced resources have now stopped industrialised manufacturing. Global economic growth has been negative throughout the war and global debt levels to fund the war have skyrocketed.

This is regarded as the World War III scenario.

1.2.2. Scenario Analysis

Figure 4 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the World War III scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	**1**	**1**	1	1	**1**
	0	0	0	0	0	0
	-1		-1	**-1**	**-1**	

Figure 4: Scenario 4 - State Vectors

Figure 5 and Figure 6 shows the results of this scenario. It should be noted that this scenario is almost as severely negative as Scenario 1: Expected Worst Case with only slightly less permutation. Pressure on Margins again seems to be reduced due to Resource Nationalism and high Market Commodity Prices. It is evident however that Export Revenue, Foreign Direct Investment and GDP Growth decrease significantly, while Regulatory Environment Uncertainty, Government Demands and Labour Unrest increases.

These results show a severely negative position for the future of SA Mining.

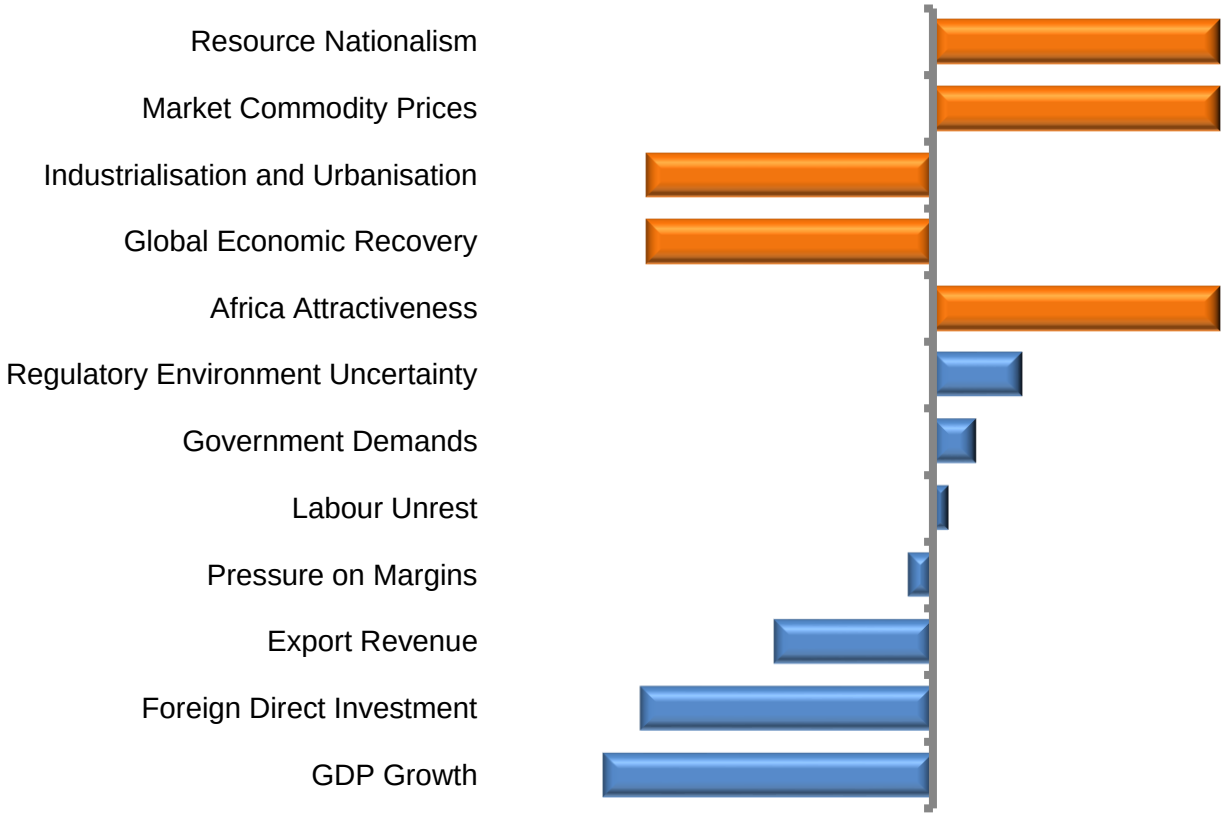

Figure 5: Scenario 4 - Results (Median)

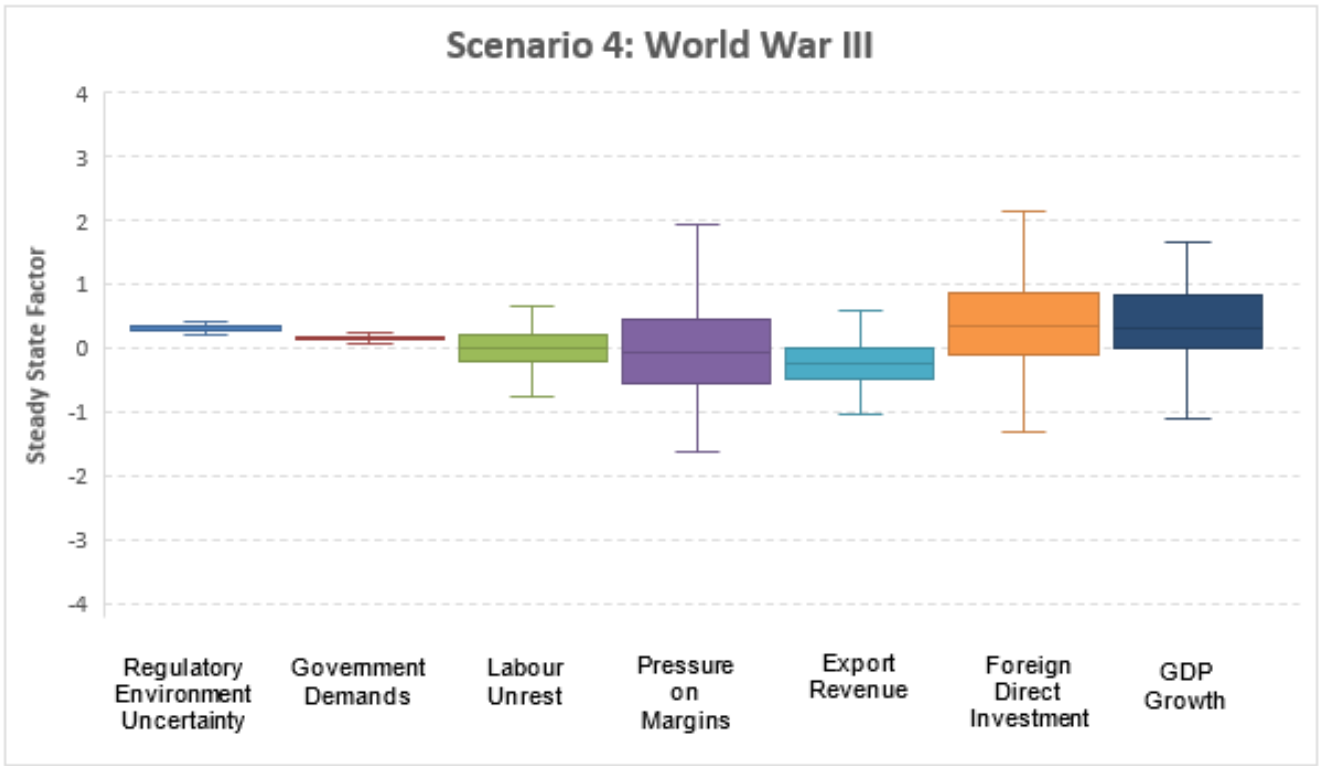

Figure 6: Scenario 4 - Results (Boxplot)

1.3. Scenario 5: Non-Mining Sectors Thrive

1.3.1. Scenario Narrative

The year is 2038 and SA's National Development Plan (NDP) has delivered on its promises – a thriving SME sector, manufacturing and financial services contributing positively to GDP growth, job creation, infrastructure and equality – however the mining sector has not enjoyed the same growth.

Commodity prices have been bearish ever since the adoption of the Dollar as a single global currency, to offset the deflationary effects of cryptocurrencies. Although a single currency has helped SA and other developing countries to level the playing field, it has hurt the value of exports. Contrarily, this has given rise to major industrialisation capital in developing countries and people have urbanised at a rapid pace, which has again promoted export value for resources.

The single global currency has ensured a free market for mining but has left African economies unprotected against economic shocks as a "one size fits all" policy has been instituted – individual countries can no longer manage monetary policy to correct economic distress. SA has been lucky to benefit from the transition in other non-mining sectors and the rest of the world is enjoying economic growth, for now…

This is regarded as the Non-Mining Sectors Thrive scenario.

1.3.2. Scenario Analysis

Figure 7 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the Non-Mining Sectors Thrive scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	1	1	**1**	**1**	1
	0	**0**	0	0	0	**0**
	-1		**-1**	-1	-1	

Figure 7: Scenario 5 - State Vectors

Figure 6 and Figure 7 shows the results of this scenario. Interestingly, Regulatory Environment Uncertainty and Government Demands have no effect and this may be attributed to the certainty and lack of individual government control that comes with a single global currency. Labour Unrest subsides in this scenario due to the thriving economy seen by a significant increase in Export Revenue, Foreign Direct Investment and GDP Growth. Pressure on Margins is stable due to the global trade equality in this scenario.

These results show a positive position for the future of SA Mining.

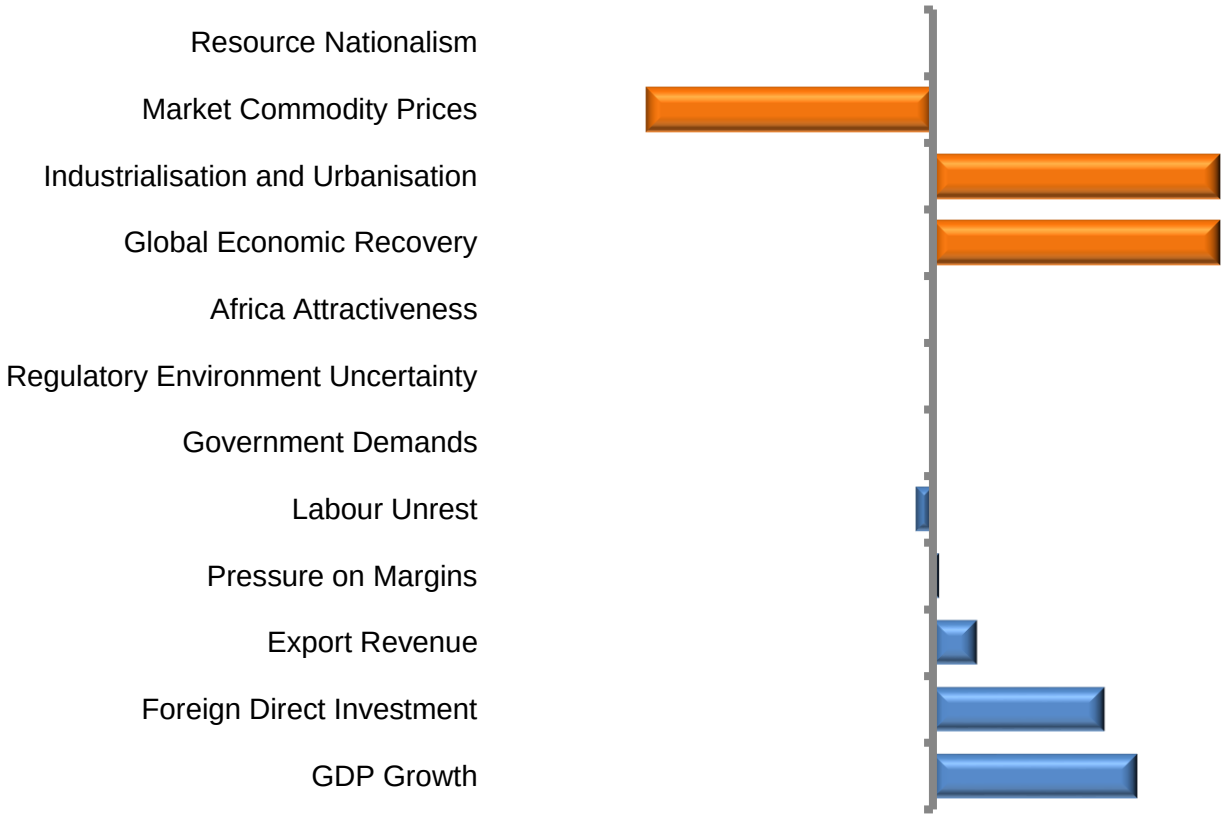

Figure 8: Scenario 5 - Results (Median)

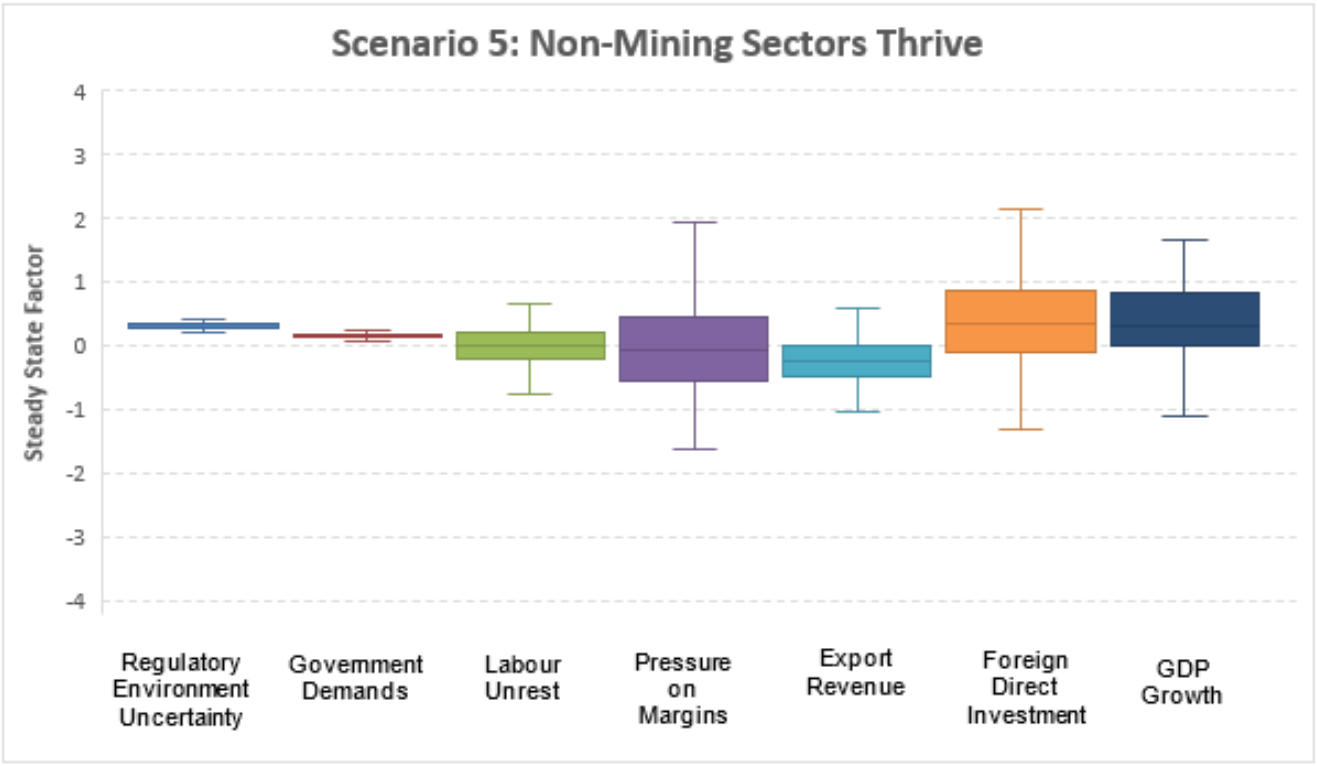

Figure 9: Scenario 5 - Results (Boxplot)

1.4. Scenario 6: Protectionist Over Supply

1.4.1. Scenario Narrative

The year is 2038 and the mining industry is rife with competition. Numerous junior miners have started up due to ever-decreasing barriers to entry, such as lower capital investment, lack of regulation and technological innovation. Large mining conglomerates still have superior operating costs and portfolio diversification but have been met with fierce competition on volumes in the market from the coalition of junior miners. Buy-out deals from conglomerates have failed to subside the supply war and as a result the market has been flooded with an over-supply of products. Commodity prices have been driven down and in an attempt to rescue SA's junior miners from bankruptcy, the SA government has embarked on a campaign to nationalise SA mines.

The demand for commodities has remained constant as industrialisation and urbanisation has been relatively stagnant. Global economic growth and recovery has however been positive since the recession in 2008, yet Africa has not been attractive to investors due to political turmoil and difficult mining conditions.

This is regarded as the Protectionist Over Supply scenario.

1.4.2. Scenario Analysis

Figure 10 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the Protectionist Over Supply scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	**1**	1	1	**1**	1
	0	0	0	**0**	0	**0**
	-1		**-1**	-1	-1	

Figure 10: Scenario 6 - State Vectors

Figure 11 and Figure 12 shows the results of this scenario. Export Revenue and Foreign Direct Investment has decreased significantly, with a moderate decrease in GDP Growth. Regulatory Environment Uncertainty and Government Demands have increased, whilst Labour Unrest and Pressure on Margins have remained relatively stable, although Pressure on Margins may vary significantly.

These results show a moderately negative position for the future of SA Mining.

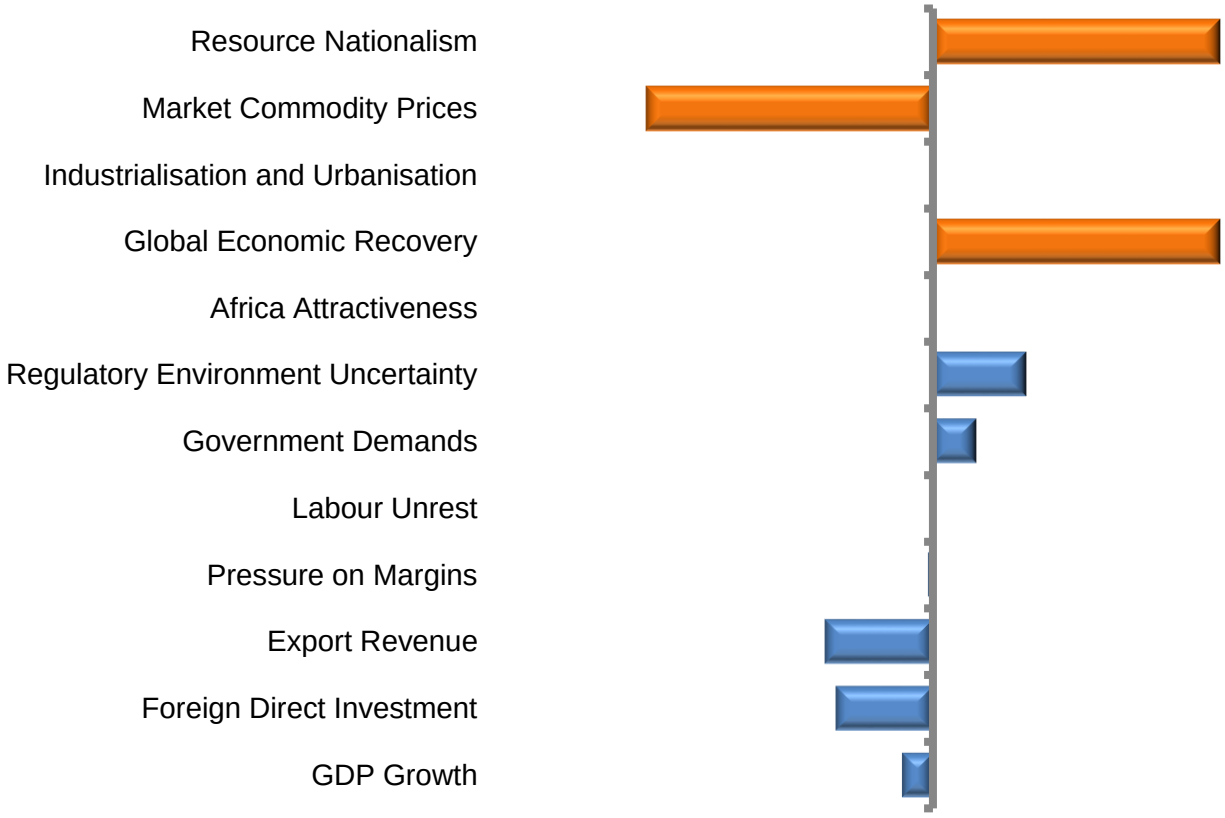

Figure 11: Scenario 6 - Results (Median)

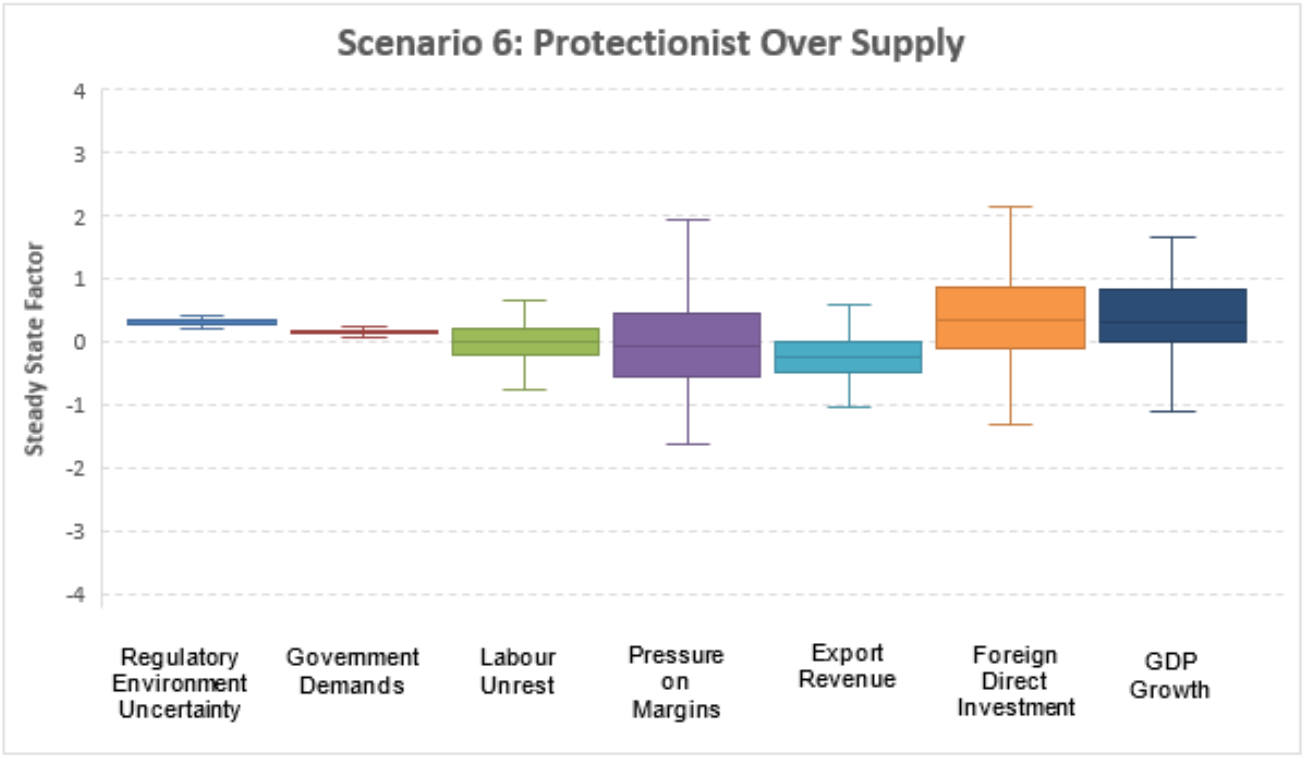

Figure 12: Scenario 6 - Results (Boxplot)

1.5. Scenario 7: Wait for Africa to Bloom

1.5.1. Scenario Narrative

The year is 2038 and the world's mineral reserves are depleting at a rapid pace – all except Africa which has become known as the potential 'last frontier' to sustain global mining demand. The problem is timing. Global economic growth and industrialisation has slowed due to trade barriers between the US and China. Poverty has risen due to the increased cost of living from locally made products and therefore people are moving to rural areas. Governments are not employing quantitative easing or other monetary policy methods to boost the economy for fear of sparking another recession. The counter-effects of lower demand and resource scarcity have kept commodity prices relatively constant.

With Africa sitting on the world's final reserves, it is needed more than ever to offset the current economic climate. However, for a multitude of reasons, Africa does not seem to be operationalising mines and delivering resources to the global market fast enough. Political uncertainties, difficult mining and trade barriers between African countries are keeping the global market at bay and incurring large costs while waiting for Africa to fully realise its potential. It is expected that Africa will start delivering when the economic climate and demand for resources improves, but this is somewhat of a catch-22 and in the mean time the mining industry is in limbo.

This is regarded as the Wait for Africa to Bloom scenario.

1.5.2. Scenario Analysis

Figure 13 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the Wait for Africa to Bloom scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	1	1	1	1	**1**
	0	**0**	**0**	0	0	0
	-1		-1	**-1**	**-1**	

Figure 13: Scenario 7 - State Vectors

Figure 14 and Figure 15 shows the results of this scenario. GDP Growth has suffered the most, while Foreign Direct Investment has decreased moderately. Export Revenue has decreased slightly, with all other drivers remaining stable – and even with little perturbation. This scenario shows that if the SA mining industry is waiting and not growing, then it is shrinking.

These results show a negative position for the future of SA Mining.

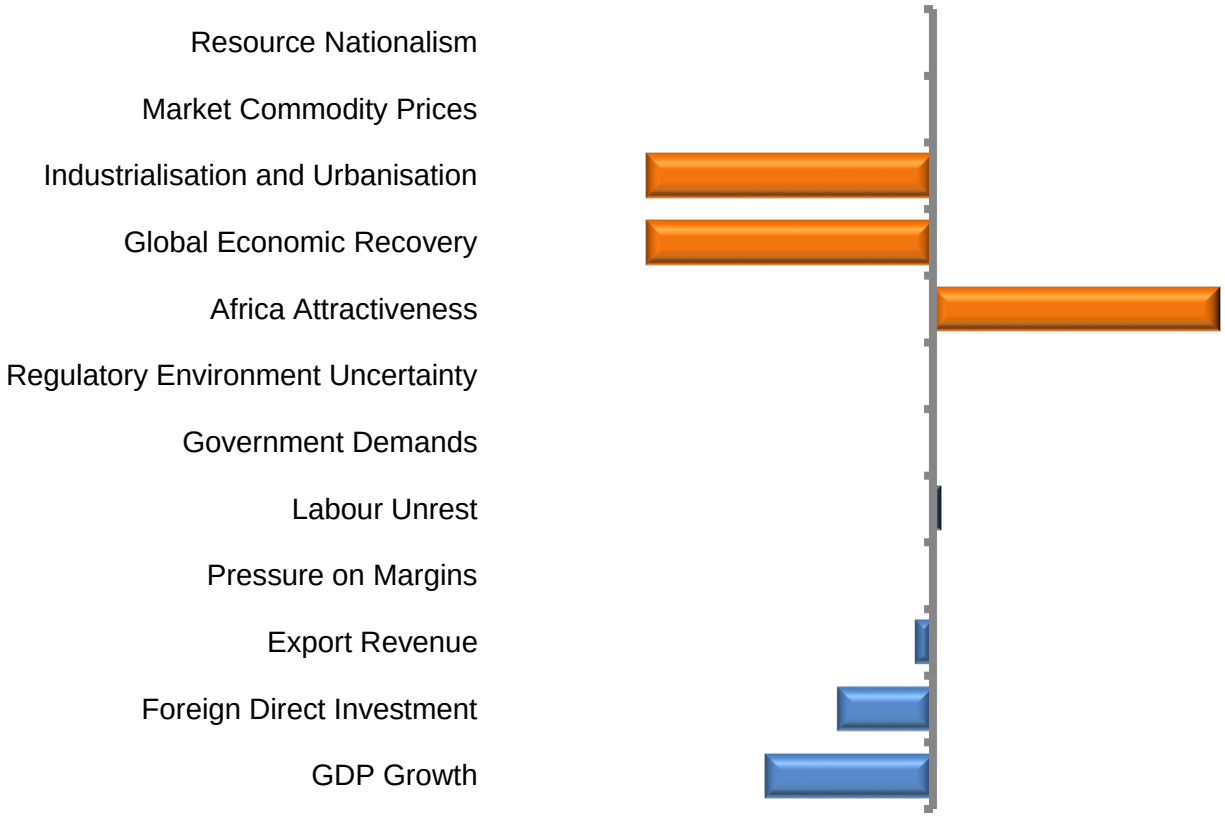

Figure 14: Scenario 7 - Results (Median)

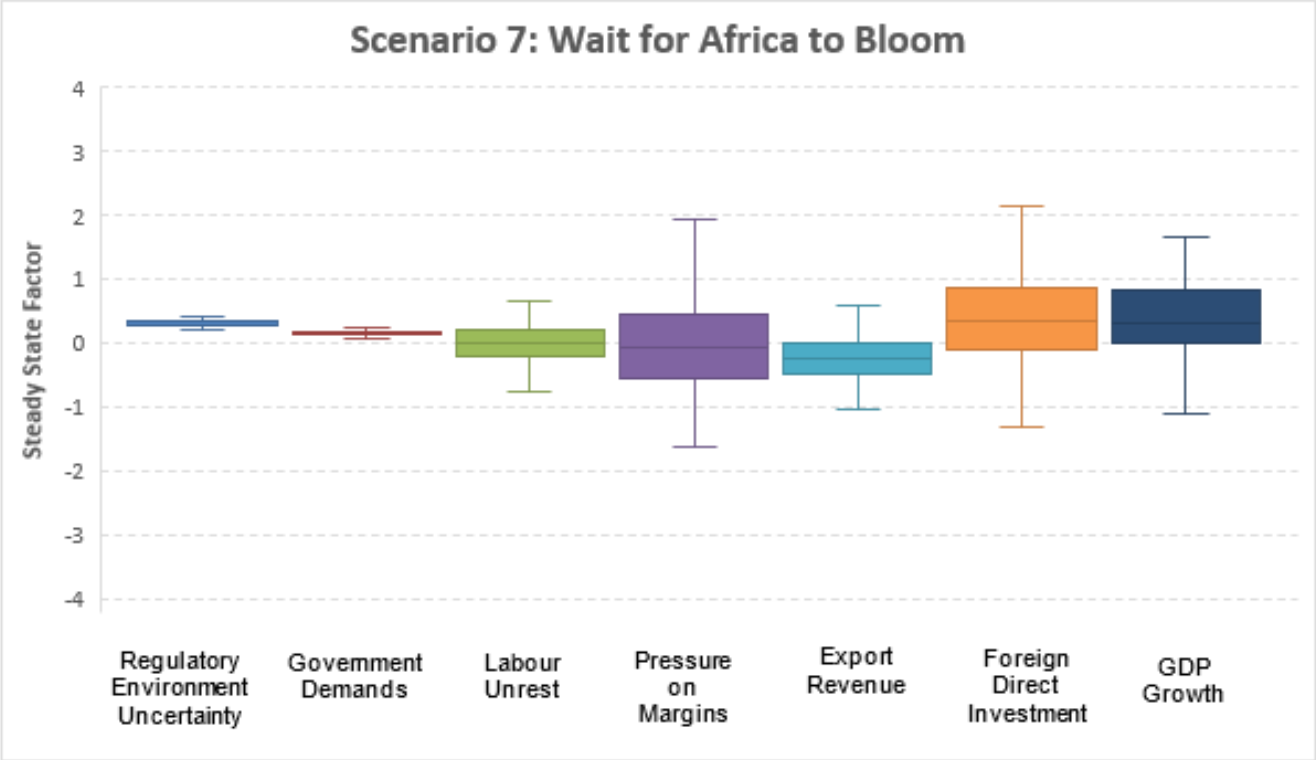

Figure 15: Scenario 7 - Results (Boxplot)

1.6. Scenario 8: Stale Mate

1.6.1. Scenario Narrative

The year is 2038 and the world's economies are firing on all cylinders. Economic growth is at unprecedented levels, industrialisation and urbanisation have increased dramatically in the last decade and investors are looking to Africa for large returns. High demand is driving commodity prices up significantly and mining operations can't seem to supply fast enough which is compounding the bullish trend.

However, SA and the rest of Africa have nationalised mines and are preventing corporates from accessing mineral wealth in this boom cycle. This was instituted 20 years ago when African governments wanted to secure wealth, protect jobs and sustain their economies in a downturn that lasted for a decade. Today, the cycle has turned and mines are still owned and operated by the state, locking external investors and business out of the country.

This is regarded as the Stale Mate scenario.

1.6.2. Scenario Analysis

Figure 16 represents the Transmitter Nodes described in the scenario narrative. This unique assembly of state vector values (shown in Yellow colour) constitutes the Stale Mate scenario.

		Resource Nationalism	Market Commodity Prices	Industrialisation and Urbanisation	Global Economic Recovery	Africa Attractiveness
State Vectors	**1**	**1**	**1**	**1**	**1**	**1**
	0	0	0	0	0	0
	-1		-1	-1	-1	

Figure 16: Scenario 8 - State Vectors

Figure 17 and Figure 18 shows the results of this scenario. Foreign Direct Investment and GDP Growth have performed extremely well, but Export Revenue has decreased significantly. Pressure on Margins is somewhat down and Labour Unrest is stable, but Regulatory Environment Uncertainty and Government Demands have increased.

There are conflicting results in this scenario, but overall a negative position is shown for the future of SA Mining.

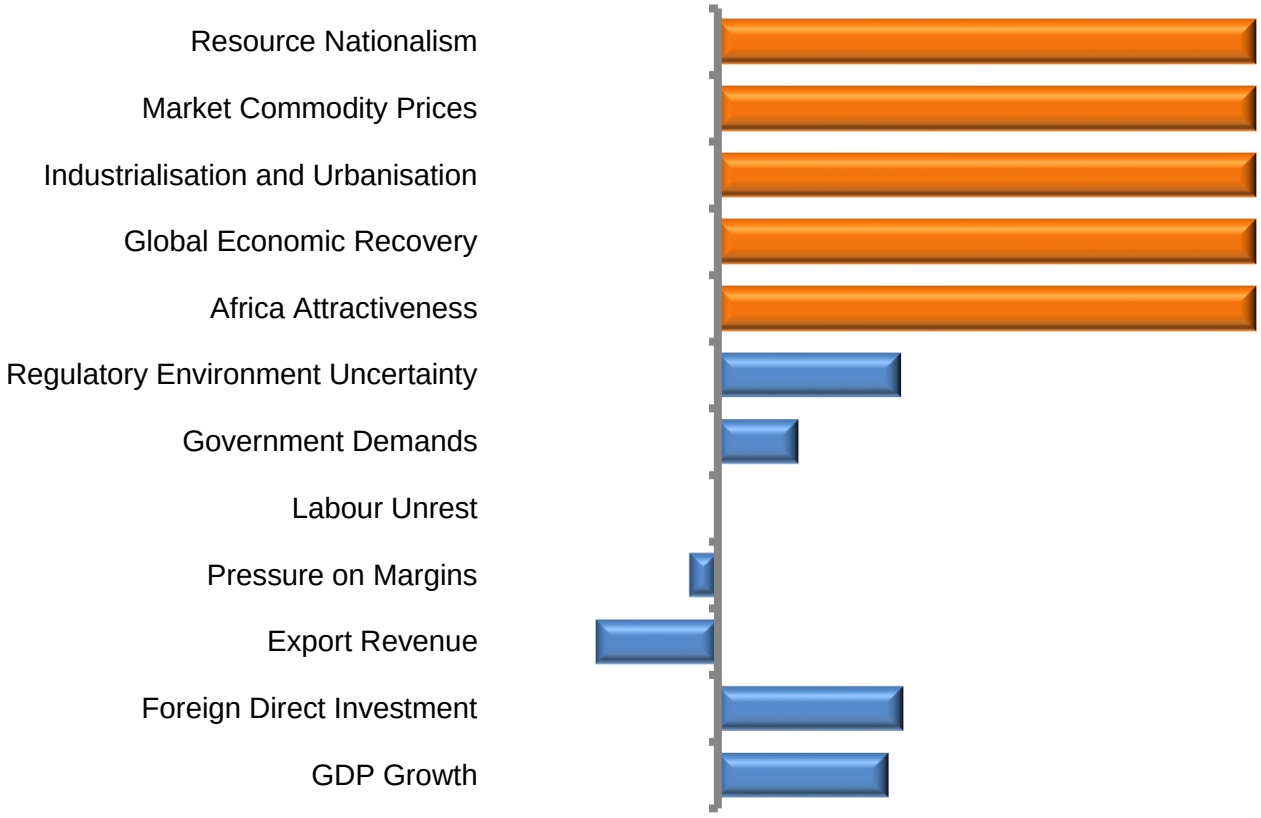

Figure 17: Scenario 8 - Results (Median)

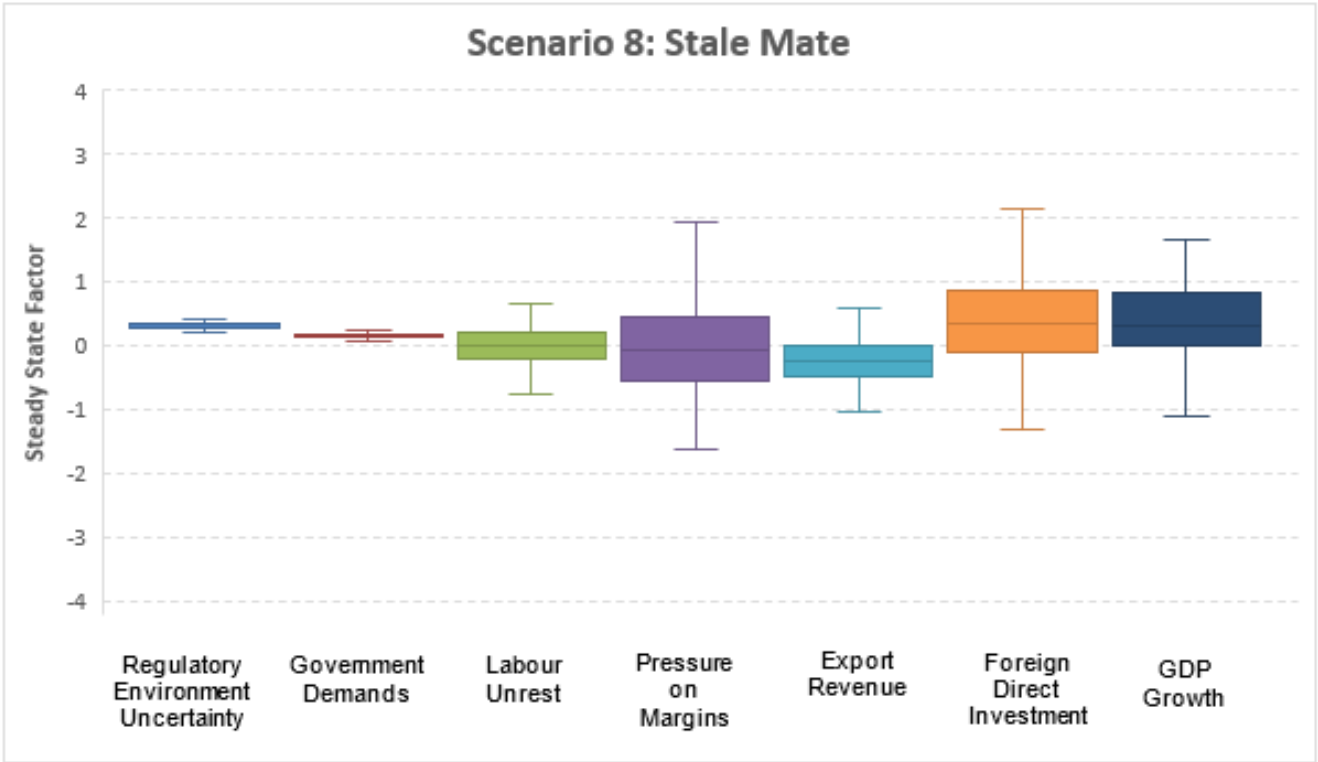

Figure 18: Scenario 8 - Results (Boxplot)